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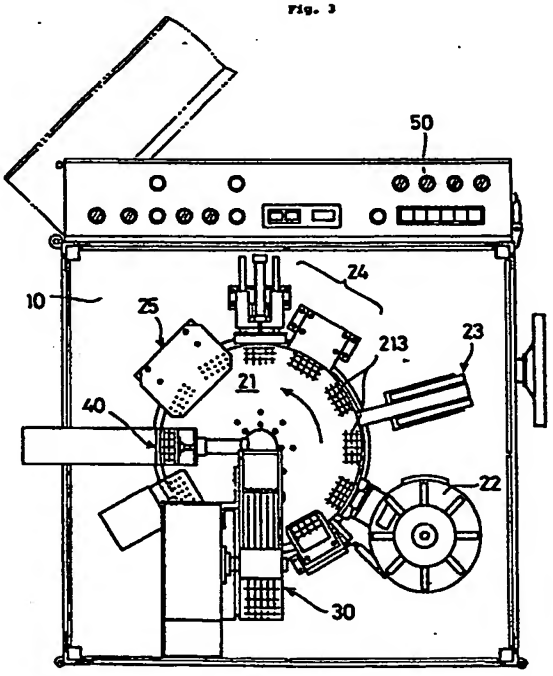
(54) A capsule charging apparatus.

(57) A capsule charging apparatus for charging a hard gelatin capsule with a filling of powder, granule, or liquid continuously at every constant amount, in which operation processes such as receiving, holding, separating, charging with the filling, recoupling, and ejecting of the capsule are performed in order during one rotation of a turntable (21) at plural positions defined by a predetermined rotation angle by which the turntable intermittently rotates, the turntable (21) comprising a pair of rotary members (212 and 215) disposed opposite to each other with a fixed space therebetween in the vertical direction of a vertical shaft (211), and between the upper and lower rotary members (212 and 215) being interposed capsule guide members (27) for connecting cap containing pockets (213) with corresponding body containing pockets (216) of the rotary members in order to separate the capsule into the cap and body and recouple them.

Fig. 3



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A CAPSULE CHARGING APPARATUS

The present invention relates to a charging apparatus for charging a hard gelatin capsule (hereinafter, merely called "the capsule") with a certain form of filling, and more particularly to a charging apparatus for charging the capsule with pharmaceutics or foodstuffs in powder, granule or liquid form, continuously in constant amounts.

As well-known, capsules charged with medicine as well as tablets and pellets are at present generally used as oral medicine in the field of medicament.

Such a capsule charged with medicine is obtained by charging the pharmaceutics in powder, granule or liquid form, at a predetermined amount into a small vessel made of gelatin, that is, an empty capsule, comprising a tubular body portion which is usually open at one end and domically closed at the other end and a cap portion which is the same in shape as the body portion and of a slightly larger inner diameter than an outer diameter of the body portion, the body and cap being coaxially coupled with each other (i.e., the open end of the body is inserted into the open end of the cap). The pharmaceutics are charged into the capsule at high speed and automatically in continuation by use of an apparatus usually called a capsule charging apparatus.

The capsule charging apparatus has hitherto been put in practical use in various models. Furthermore, various improvements have been proposed aiming at high speed charging (improved processing ability), improvement in charging accuracy and/or miniaturization of apparatus, which are disclosed in, for example, the Japanese Patent Publication No. 49-38813 and Japanese Laid-Open Patent Publication No. 61-213050. The well-known capsule charging apparatus of these prior applications are so constructed that in order to ensure a space for supplying filling onto the bodies of capsules in the charging process, separated caps are grouped into a plurality of members and each group is temporarily moved upwards from the bodies, or while keeping the caps as they are, the bodies are projected in the radial direction of a rotary member for containing them and temporarily separated from the caps.

Accordingly, the conventional capsule charging apparatus nearly always attains the object of charging the filling at high speed, but it is inevitable to make the apparatus large-sized as a whole, and it is largely inconvenient for over all maintenance to adjust the apparatus when the applied capsules are changed in the size.

The capsule charging apparatus of this invention, which overcomes the above-discussed and numerous other disadvantages and deficiencies of the prior art, is a capsule charging apparatus for charging a hard gelatin capsule with a filling of powder, granule, or liquid continuously in constant amounts, wherein the capsule having a cap and a body coupled together is received and held in an upright posture at one of the positions in which a turntable intermittently rotatable through every predetermined rotation angle around a vertical shaft pauses, and operation processes such as separation of said cap from said body of said capsule, charging of said filling into said body, coupling of said cap with said body, and ejection of said charged capsule are performed in order during one rotation of said turntable at plural positions including said position which are defined by said rotation angle of said turntable, said capsule charging apparatus being characterized in that said turntable comprises a pair of rotary members disposed opposite to each other with a predetermined space therebetween in the vertical direction of said vertical shaft of said turntable, and between said upper and lower rotary members are interposed capsule guide members capable of connecting cap containing pockets with corresponding body containing pockets of said rotary members for separating of said capsule into said cap and body and recoupling of them.

In a preferred embodiment, the capsule guide member for separating said capsule comprises tubular members inserted one end thereof movably in the vertical direction into pocket bores with large diameter allowing said capsule to pass therethrough, and said capsule guide member for coupling said capsule comprises tubular members provided movably in the vertical direction allowing said capsule to pass therethrough.

In a preferred embodiment, the capsule body is charged by natural fall of said filling.

In a preferred embodiment, the capsules are substantially simultaneously processed in groups consisting of a plural number of capsules in a series of said operation processes.

Thus, the invention described herein makes possible the objective of providing a capsule charging apparatus which is simplified in mechanism, designed to be small-sized as a whole, and superior in work efficiency and productivity.

For a better understanding of the invention and to show how the same can be carried into effect, reference will now be made, by way of example only, to the accompanying drawings, wherein:

Figure 1 is a schematic side view of a capsule charging apparatus of the present invention.

Figure 2 is a front view of the capsule charg-

ing apparatus of the present invention.

Figure 3 is a plan view of the capsule charging apparatus of the present invention.

Figure 4 is a plan view showing the capsule charging apparatus of Figure 3 in slightly more detail in the state where a cap rotary member is removed therefrom.

Figure 5 is a side view illustrating the relation between a capsule direction regulating mechanism and a charging mechanism of the capsule charging apparatus of the present invention.

Figures 6A and 6B are sectional side views of a part of the capsule charging apparatus showing a separation process of a capsule into a body and a cap.

Figures 7A and 7B are sectional side views showing an operation process for removing unseparated or inverted capsules in the capsule charging apparatus of the present invention.

Figure 8 is a sectional side view showing an operation process for charging capsules with filling in the capsule charging apparatus of the present invention.

Figures 9A, 9B, and 9C are sectional side views showing a compression mechanism for the filling of the capsule charging apparatus of the present invention.

Figure 10 is a sectional side view showing a recoupling process of the capsule charging apparatus of the present invention.

Figure 11 is a sectional side view showing a process for ejecting charged capsules in the capsule charging apparatus of the present invention.

Figure 12 is a sectional side view showing a filling supply mechanism of the capsule charging apparatus of the present invention.

Next, an embodiment of the invention will be detailed in accordance with the accompanying drawings.

The capsule charging apparatus of the present invention, as shown in Figures 1 through 4, is provided on a stand **10** with a charging mechanism **20** as a main part, a capsule direction regulating mechanism **30**, a charged-capsule ejection mechanism **40**, and a control panel **50** for controlling these mechanisms. The charging mechanism **20** has a filling supply mechanism **22**, a vibration applying mechanism **23** for the filling, a filling quantifying mechanism **24**, a capsule coupling mechanism **25**, a cleaning mechanism **26** or the like, which are disposed around a turntable **21** which intermittently rotates in the direction shown by an arrow and pauses at every predetermined rotation angle around the vertical shaft while transferring capsules. These mechanisms are relevant to each other as well as to other mechanisms and members (not shown) and operate with a timing corresponding to intermittent rotation of the turntable **21** as a whole, which will be detailed below.

The capsule direction regulating mechanism **30**, as shown in Figure 5, comprises a supply drum **32** contacting at a part of the circumferential surface thereof with a lower supply port of a hopper **31**, a regulating roller **33** provided below the supply drum **32** to face the lower portion of the supply drum **32**, a contrarotating drum **34** provided below the regulating roller **33** to face the lower portion of the regulating roller **33**, and a capsule transporting mechanism **35** provided below the contrarotating drum **34** to face the lower portion of the contrarotating drum **34**. A large number of empty capsules which are contained in the hopper **31** at random and in a state where caps and bodies of capsules are temporarily coupled are arranged with bodies facing downward, delivered to the capsule transporting mechanism **35**, and then transported in order to the capsule charging mechanism **20**. In addition, a rotatable brush roller **36** is provided above the supply drum **32** to face the uppermost portion of supply drum **32**. The capsule direction regulating mechanism **30** is disclosed in detail as a capsule direction regulating apparatus in, for example, Japanese Laid-Open Patent Publication No. 61-211213 which is an application by the applicant of this invention, and which is well-known in itself, thereby omitting detailed description of concrete operation of the above members and mechanisms. Alternately, the capsule charging apparatus of the invention may invoke any desirable direction regulating system other than the aforesaid one.

The capsule charging mechanism **20**, as above-mentioned, comprises the turntable **21** which conveys capsules by rotating intermittently in the direction shown by an arrow at each predetermined rotation angle around a vertical shaft **211** (i.e., rotating intermittently so as to pause in each of the positions I to XII shown in Figure 4), and the capsule transporting mechanism **35** of the capsule direction regulating mechanism **30**, a filling supply mechanism **22**, a vibration applying mechanism **23** for the filling, a filling quantifying mechanism **24**, a capsule coupling mechanism **25** and a cleaning mechanism **26**, which are disposed around the turntable **21** and regularly spaced apart from each other at fixed intervals determined by a predetermined rotation angle.

The turntable **21** comprises a pair of rotary members **212** and **215** disposed opposite to each other with a predetermined space therebetween in the vertical direction of vertical shaft **211**. The rotary member positioned above the vertical shaft **211** (i.e., a drive shaft) serves as a cap rotary member. On the disc surface of the cap rotary member, a large number of cap containing pockets **213** for holding the caps separated from the bodies are bored regularly in groups consisting of a fixed

number of pockets (in the shown embodiment, 12 groups of 15 pockets each: 180 pockets in total). Meanwhile, the rotary member **215** disposed opposite to and below the cap rotary member **212** serves as a body rotary member. On the disc surface of the body rotary member, body containing pockets **216** are regularly provided corresponding to and equal in number to the cap containing pockets **213** of the cap rotary member **212**.

The upright capsules delivered from the capsule transporting mechanism **35** are at first held as they are in the cap containing pockets **213** and then separated bodies from caps in preparation for being charged with the filling. The capsule charging apparatus of this invention has a capsule guide member **27** which is interposed between the cap rotary member **212** and the body rotary member **215** and connects the cap containing pockets **213** to the body containing pockets **216** corresponding thereto respectively when the capsules are separated into caps and bodies. The capsule guide member **27**, as shown in Figures 6A and 6B, comprises pocket bores **272** bored at a capsule guide base **271** and tubular members **273**. As the inner diameter of the pocket bore **272** is larger than the outer diameter of the tubular member **273**, the tubular member **273** is inserted at one end thereof into the bore **272** so as to allow the capsule to pass. The tubular members **273** are fixed to a movable panel **274** which can move in vertical direction with respect to the capsule guide base **271** by means of an arm **275**.

When the body and cap of each capsule are separated from each other and recoupled with each other after being charged with a filling (in other words, during the stop of intermittent rotation of the rotary members), which will be discussed below, the capsule guide base **271** of the capsule guide member **27**, as shown in Figure 6A, moves close to the upper surface of the body rotary member **215** with a slight gap remaining therebetween, and the movable panel **274** raises close to the lower surface of the cap rotary member **212** by lifting the arm **275** in a relation of nearly contacting with the lower surface of the cap rotary member **212**, so that the cap containing pockets **213** and body containing pockets **216** corresponding thereto substantially communicate with each other, thereby forming a passage through which the body separated from the cap falls. Accordingly, in this state, each capsule body separated from the cap is guided by the capsule guide member **27** and completely held in the corresponding body containing pocket **216**.

Meanwhile, when the body rotary member **215** and cap rotary member **212** intermittently rotate, as shown in Figure 6B, the arm **275** of the capsule guide member **27** operates just before the rotation of the rotary members to move the capsule guide base **271** and movable panel **274** fully away from the body rotary member **215** and cap rotary member **212**, thereby performing the intermittent rotation of both the rotary members without hindrance.

The filling supply mechanism **22**, as shown in Figures 3 and 4, is provided in the vicinity of the body rotary member **215** and downstream of the capsule transport mechanism **35** in the direction of rotation of the rotary member **215**, and comprises a filling hopper **221** and a filling supply damper **222** which communicates at one end with a lower opening of the hopper **221** and is open at the other end into an area of a charging room on the body rotary member **215**. In addition, an agitator (vanes) **223** which is equipped in the hopper **221** may be omitted by the property, especially the fluidity, of filling. Although the filling supply mechanism in this embodiment shown by the drawings is for the filling of powder, when the filling is granule or liquid, it must be changed to a different filling supply mechanism for granule or liquid.

The filling, such as powder, supplied from the filling supply mechanism **22** to the charging room area on the body rotary member is subjected to vibrations from a vibrating plate **231** by the vibration applying mechanism **23**, thereby ensuring good fluidity. Accordingly, the filling in this state naturally falls (flows down) into the capsule bodies contained at the bottoms of the body containing pockets via each body containing pocket **216** open at the charging room area, thereby being charged in the capsule bodies and body containing pockets. Herein, the charging room area indicates an area on the upper surface of the body rotary member **215** from the position where the filling supply damper of the filling supply mechanism **22** is disposed to the filling quantifying mechanism, and is partitioned by an outer peripheral wall **217** and an inner peripheral wall **218** in the radial direction of the rotary member **215**.

The filling quantifying mechanism **24** comprises a compression mechanism **241** for the filling charged in the capsule bodies and body containing pockets **216** and a weighing mechanism **246** for scraping-off surplus fillings staying on the body rotary member **215** along the surface of the body rotary member. The filling compression mechanism **241**, as shown in Figures 9A, 9B and 9C, is composed of a combination of a depressing plate **242** fixed on and closed to the surface of the body rotary member **215** against one group of body containing pockets, and body pushers **243** for pushing up the capsule bodies through the through bores at the bottom of body containing pockets **216**. The weighing mechanism **246**, as shown in Figure 4, is disposed one rotation angle above the filling compression mechanism **241** in the direction

of rotation of the body rotary member and has a scraper plate **247** as its main part which reciprocates in the radial direction on the body rotary member along the upper surface thereof. The scraper plate **247**, by its reciprocating motion, scrapes off the surplus filling staying on the body rotary member **215** (over the body containing pockets **216**), thereby equalizing the amount of filling in each body containing pocket. The amount of filling can be adjusted minutely by controlling the up-and-down stroke of body pushers **243** of the compression mechanism **241**.

The capsule coupling mechanism **25** is equipped one rotation angle next to the filling quantifying mechanism **24** in the direction of rotation and, as shown in Figure 10, comprises a cap depressing plate **251** fixed close to the upper surface of cap rotary member **212**, pushers **255** for pushing up the bodies charged with filling toward the cap rotary member **212** through the through bores at the bottoms of body containing pockets **216**, and capsule guide members **256** which are movable in the vertical direction for guiding the bodies, when being pushed up, to the cap containing pockets **213** of the cap rotary member from the body containing pockets **216**. In other words, each body charged with a filling is pushed up by the pusher **255** into the just above capsule guide member **256** from the body containing pocket **216**, raised as it is and together with the guide member **256** to just below the cap rotary member **212**, and then is pushed further upwardly by the pusher **255**, thereby completing coupling of the body with the corresponding cap in each cap containing pocket **213**. The capsule guide member **256** for coupling of bodies and caps is constituted of each tubular member of an inner diameter through which the capsule is allowed to pass as shown. The constitution of the capsule guide member is not limited to this embodiment. In addition, in the embodiment shown in the drawing, a further pair of cap depressing plate **251** and pushers **255** are juxtaposed at the next angle in the direction of rotation and the coupling operation is repeated, so that the pushers operate in association with the coupling motion of the body and cap as above-mentioned, thereby further ensuring coupling of them.

The capsule charged with filling with its body and cap coupled is taken out from the apparatus by a capsule ejection mechanism **40** at the next rotation angle to the coupling mechanism. As shown in Figure 11, the capsule at first is pushed up by the pusher **41** onto the cap rotary member **212** and then ejected to a chute **43** out of the system by use of a scraper **42** which moves in a radial direction on the cap rotary member along the upper surface thereof.

The cleaning mechanism **26** is disposed at the next rotation angle to the disposed position of capsule ejection mechanism **40**. After the charged capsules are ejected, the cleaning mechanism **26** cleans the surface of the body rotary member and the inside of each body containing pocket, and the surface of the cap rotary member and the inside of each cap containing pocket respectively. The cleaning mechanism is connected to an air compression apparatus and a vacuum suction apparatus (not shown) which are separately equipped.

The body containing pockets **216** and cap containing pockets **213** cleaned by the cleaning mechanism **26** receive at the next rotation angle new empty capsules aligned upright from the capsule transporting mechanism **35** and hold them in preparation for the next stage of charging the filling. Thereafter, the above-mentioned operation processes are continuously repeated so that the charged capsules can be obtained by every revolution of the body rotary member and cap rotary member.

In addition, a filling passage change-over damper **60** in Figure 4, in cooperation with filling passage guides **61** and **62** fixed close to the upper surface of body rotary member **215**, moves in the direction shown by an arrow so as to cut off flow-in of the filling from the filling supply mechanism **22** to the charging room if necessary and to guide the filling to the exterior of the charging room.

Next, explanation will be given on the operation process of each mechanism in accordance with the drawings.

(1) Capsule loading and separation (Figures 6A and 6B)

Figures 6A and 6B show the loading process of empty capsules and the separation process of the body and cap of each capsule in the apparatus of this invention. In Figure 6A, separation of the capsule is shown, in which the capsule supplied from the capsule transporting mechanism **35** is separated into the body and cap. The empty capsules at first are received in upright posture with their bodies facing downwards from the capsule transporting mechanism **35** into a plurality (15 per group) of cap containing pockets **213** of the cap rotary member **212** which rotates intermittently and pauses at every predetermined rotation angle, and then each capsule body **B** separated from the cap passes through the tubular member **273** and pocket bore **272** of the capsule guide member to be received in the corresponding body containing pocket **216** of the body rotary member **215**. A capsule separating vacuum chute **28** is provided under the body rotary member **215** so that the capsule sucked by vacuum is separated into the

body **B** and cap **C** by the stepped portion at the cap containing pocket. The capsule guide member **27** serving as an inductive route of the separated capsule body **B** to the body containing pocket comprises the pocket bores **272** and tubular members **273** which are fitted movably in the vertical direction. When the cap rotary member **212** and body rotary member **215** rotate, as shown in Figure 6B, the capsule guide member moves away from both the rotary members **212** and **215**, thereby preventing a capsule which is not separated in the separation process or a capsule body which is not completely hold in the body containing pocket from being crushed.

(2) Removal of unseparated and/or inverted capsules (Figure 7)

Figure 7A shows an operation process for removing a capsule which is unseparated or inverted. The capsule **b** which is not separated into the body and cap and the capsule **c** which is inverted (i.e., which is not regulated in proper direction), as shown in Figure 7B, are pushed up by pushers **71** into an upper recovery case **72**. Oblong holes **73** which are capable of holding capsules in condition of being pinched are formed at the recovery case **72** corresponding to the cap containing pockets **213**. The unseparated capsule **b** and inverted capsule **c** are collected in such a manner that the pushers **71** are lifted simultaneously with the falling of the recovery case **72** so as to push up the capsules **b** and **c** into the recovery case **72** through the holes **73**. The unseparated or inverted capsules contained in the recovery case **72** do not fall out therefrom because the shorter diameter of the oblong hole **73** is slightly smaller than the outer diameter of the capsule.

(3) Charging (Figures 8 and 9)

a. Powder charging

Figures 8 and 9 are schematic views showing the charging operation, in which a powder charging mechanism is exemplified. The present invention may of course apply desirable well-known charging mechanisms for granule or liquid other than the above.

A layer of a filling (powder) is provided over the body containing pockets **216** of the body rotary member **215**, the vibrating plate **231** improves the fluidity of filling, and the filling is charged by natural flow into the capsule bodies in the body containing pockets.

b. Compression

Figures 9A to 9C are schematic views showing the compression mechanism **241** for the filling at the filling quantifying mechanism **24**. As shown in Figures 9A and 9B, the depressing plate **242** is provided above the body rotary member **215** to close the open end of each body containing pocket **216**. Next, as shown in Figure 9C, the body pushers **243** push up the closed ends of capsule bodies by springs **244**, thereby moderately compressing the filling in the body **B**. The springs **244** keep biasing forces of the body pushers about uniform, thereby reducing variation in weight of filling as much as possible.

c. Filling weighing (Figures 4 and 5)

A filling to be charged in the capsule body is quantitatively weighed prior to be coupled with the cap by the filling weighing mechanism **246** shown in Figures 4 and 5. The bodies in the body containing pockets **216** of the body rotary member **215** are pushed up by the pushers and surplus filling coming out from the upper surface of body rotary member is scraped off by the scraper plate **247**. The surplus filling scraped-off is moved in the radial direction toward the center of the body rotary member **215** and removed through the charging room area, the scraper plate **247** being operated with the timing by an air cylinder **248** provided laterally thereof.

(4) Coupling (Figure 10)

Figure 10 shows an operation process of recoupling the cap with the body charged with a filling. In this process, the bodies **B** are pushed up by the pushers **255** to couple with the corresponding caps **C** at the cap rotary member. The bodies **B** pushed out from the body containing pockets **216** are received into the capsule guide members **256** positioned just above the bodies **B** and raised together with the capsule guide members **256** directly to the lower surface of the cap rotary member **212**, and thereafter only the bodies **B** are pushed further upwardly by the pushers **255** to be coupled with the caps **C** respectively. In this case, since the depressing plate **251** restrains the caps **C** from upward movement, only the push-up force of pushers **255** completely couples the bodies with the caps respectively.

(5) Ejection (Figure 11)

Figure 11 is a schematic view showing take-out of the capsule F having been charged with the filling. In this process, the charged capsules F are pushed up by the pushers 41 above the cap rotary member 212 and then pushed into the chute 43 by the scraper 42 attached to the air cylinder 44, thereby being sequentially housed into a desired container.

(6) Cleaning

This operation process is performed at the next rotation angle to the capsule ejection mechanism 40. The filling, dust, or the like, attached to the cap rotary member 212 and cap containing pockets 213 and the body rotary member 215 and body containing pockets 216, after the charged capsules have been completely taken out, are removed and cleaned by compressed air and vacuum suction, thereby contributing to maintain smooth operation of the apparatus of the invention.

(7) Supply of a filling (Figure 12)

Figure 12 shows the filling supply mechanism for powder, in which the filling charged into the hopper 221 is supplied by the filling supply damper 222 into the charging room area over the body rotary member 215. The filling supply damper 222 is actuated by the air cylinder for driving the supply damper by receiving a signal from a level detector individually provided, thereby being adapted to keep about constant the filling level on the body rotary member.

Claims

1. A capsule charging apparatus for charging a hard gelatin capsule with a filling of powder, granule, or liquid continuously in constant amounts, wherein said capsule having a cap and a body coupled together is received and held in an upright posture at one of the positions in which a turntable intermittently rotatable through every predetermined rotation angle around a vertical shaft pauses, and operation processes such as separation of said cap from said body of said capsule, charging of said filling into said body, coupling of said cap with said body, and ejection of said charged capsule are performed in order during one rotation of said turntable at plural positions including said position which are defined by said rotation angle of said turntable,
characterized in that said turntable comprises a pair of rotary members disposed opposite to each other with a predetermined space therebetween in the vertical direction of said vertical shaft of said turntable, and between said upper and lower rotary members are interposed capsule guide members capable of connecting cap containing pockets with corresponding body containing pockets of said rotary members for separating of said capsule into said cap and body and recoupling of them.

2. A capsule charging apparatus according to claim 1, wherein said capsule guide member for separating said capsule comprises tubular members inserted one end thereof movably in the vertical direction into pocket bores with large diameter allowing said capsule to pass therethrough, and said capsule guide member for coupling said capsule comprises tubular members provided movably in the vertical direction allowing said capsule to pass therethrough.

3. A capsule charging apparatus according to claim 1 or 2, wherein said capsule body is charged by natural fall of to said filling.

4. A capsule charging apparatus according to any preceding claim, wherein said capsules are substantially simultaneously processed in groups consisting of a plural number of capsules in a series of said operation processes.

Fig. 1

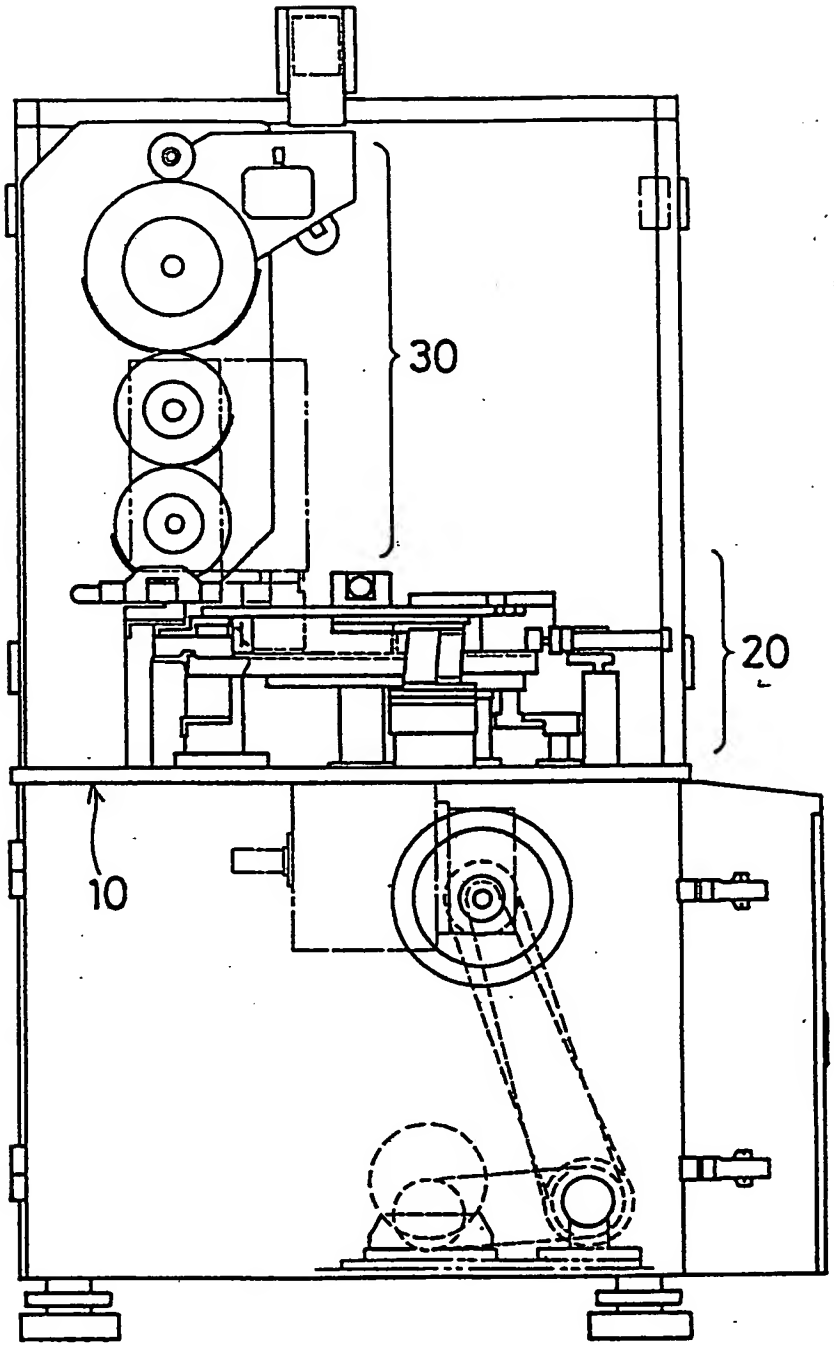


Fig. 2

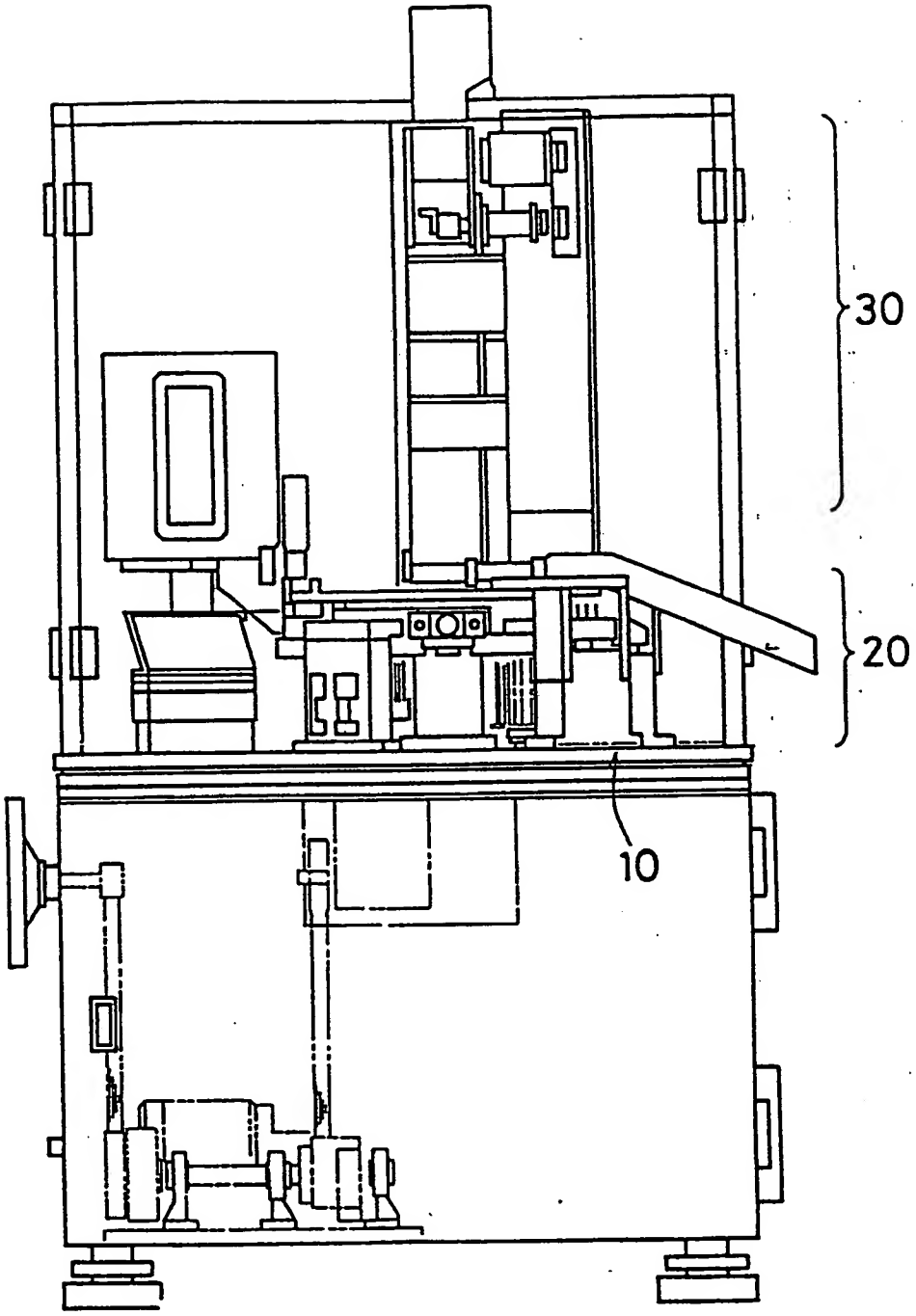


Fig. 3

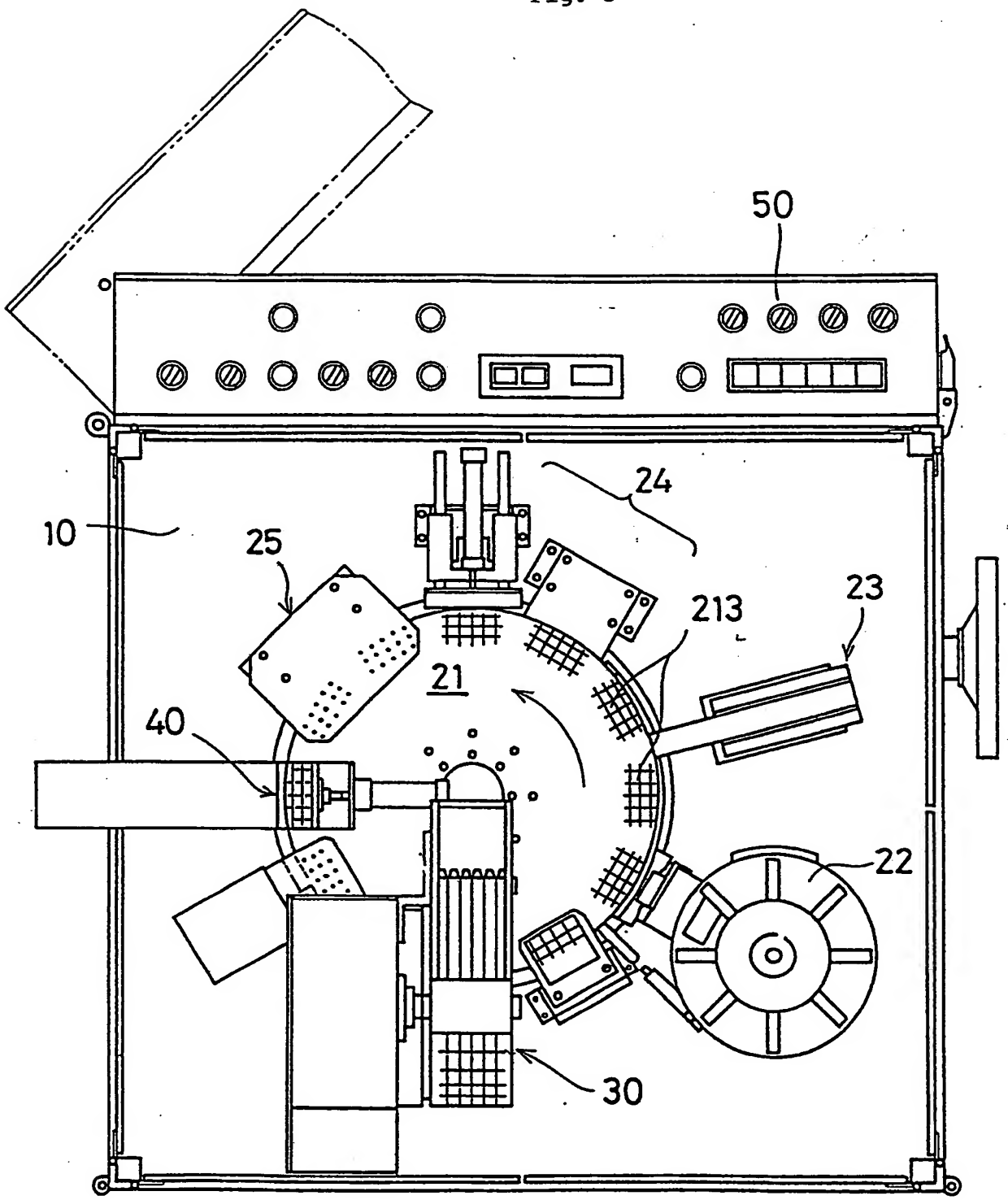
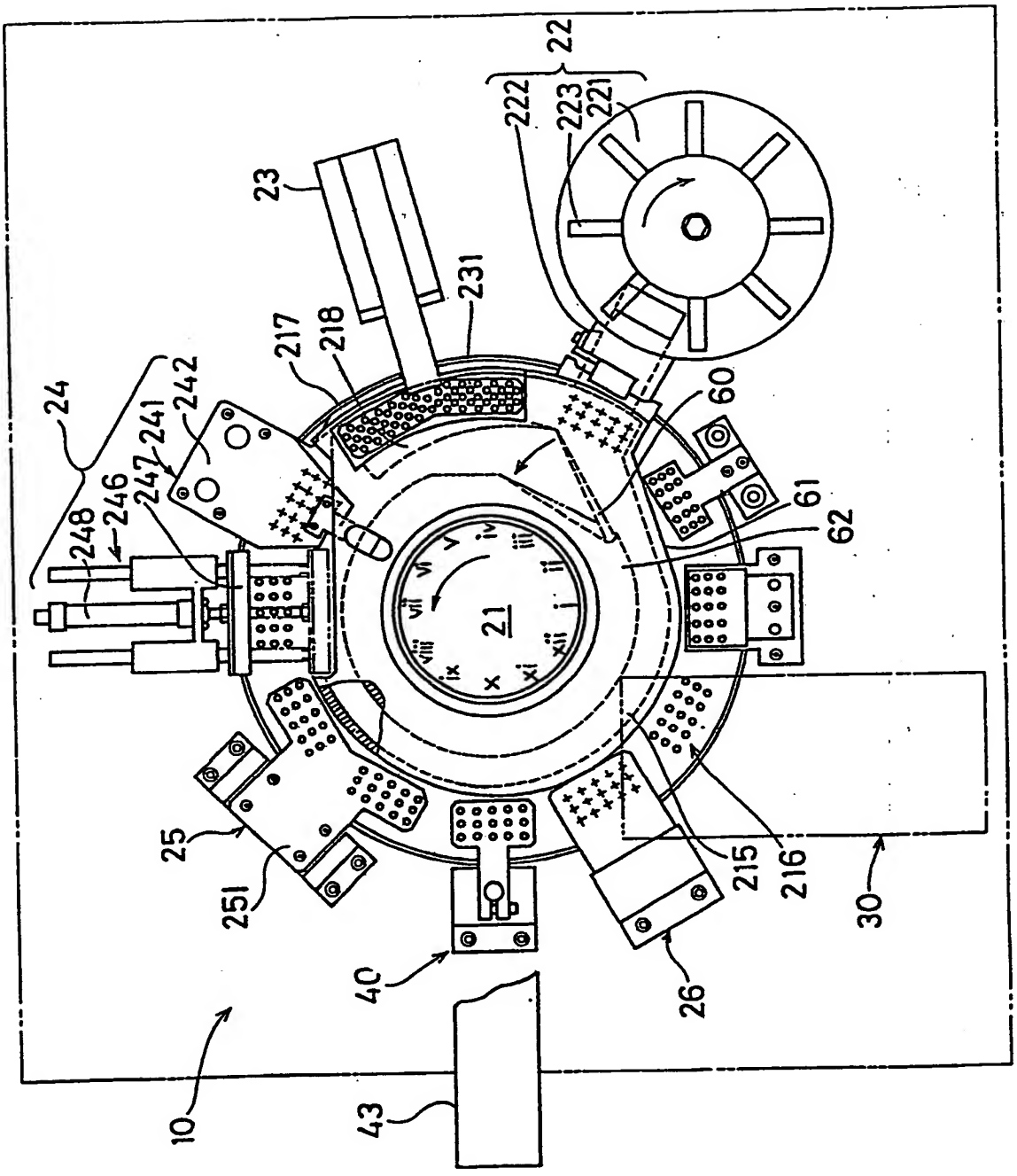


Fig. 4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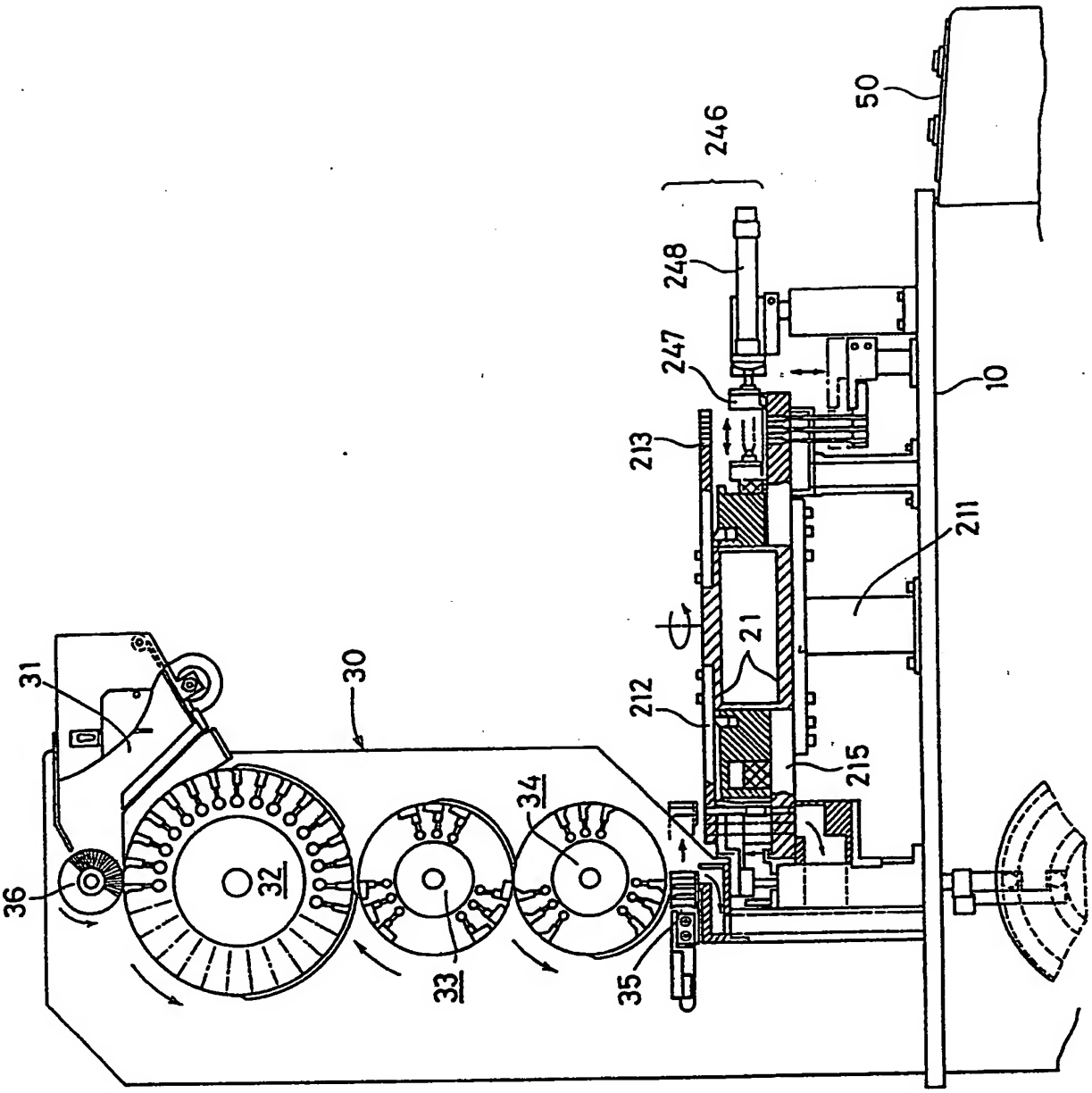


Fig. 5

Fig. 6B

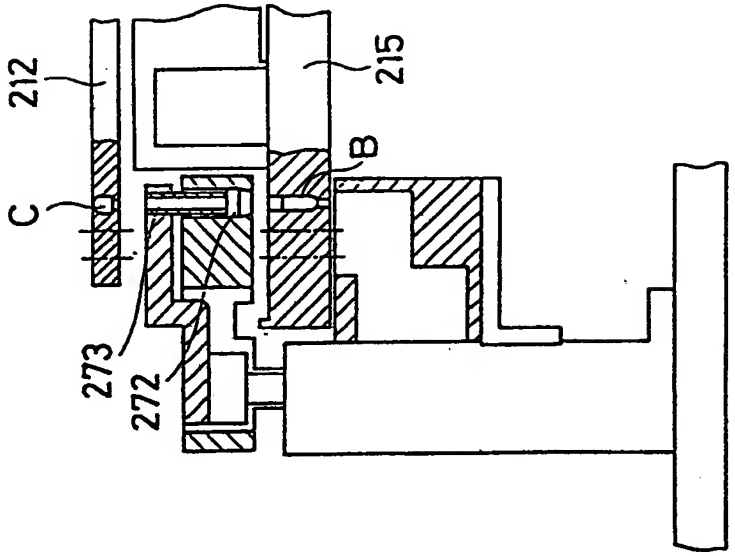


Fig. 6A

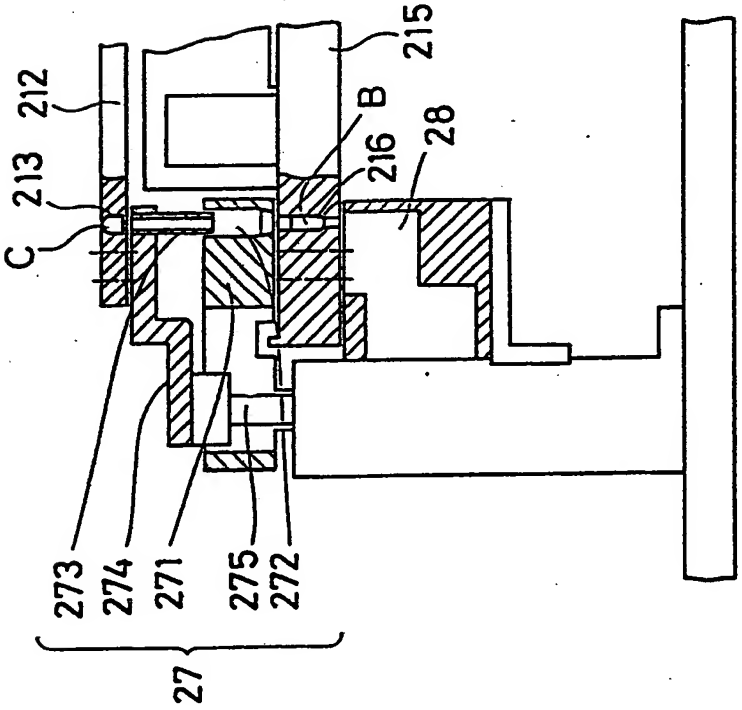


Fig. 7B

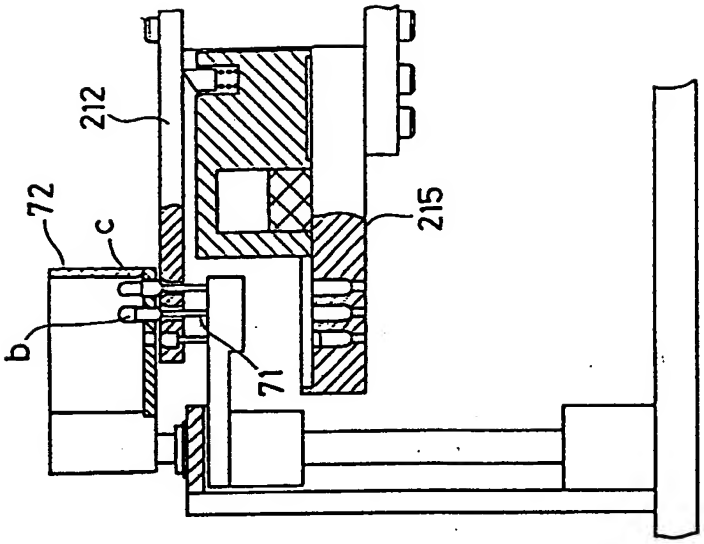
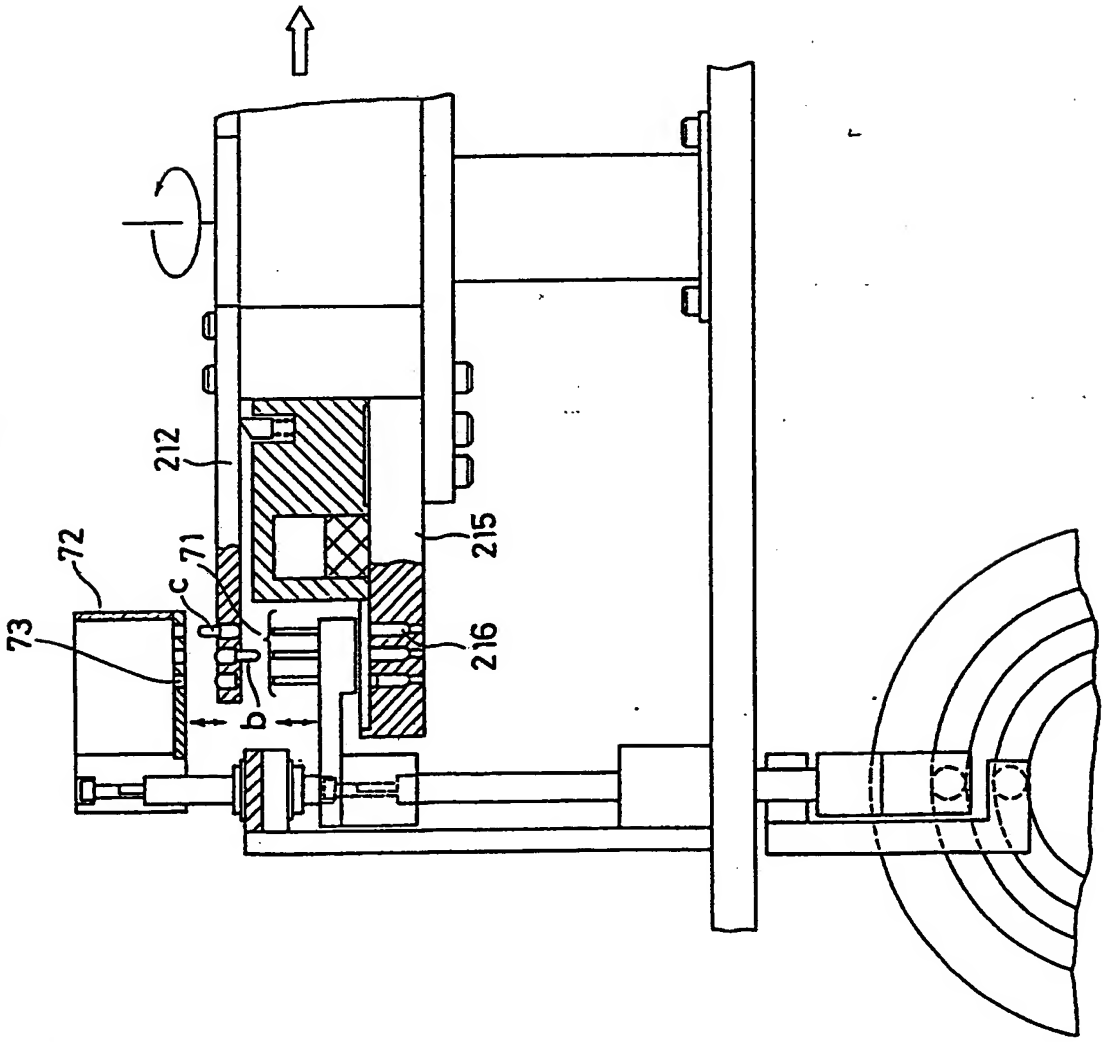


Fig. 7A



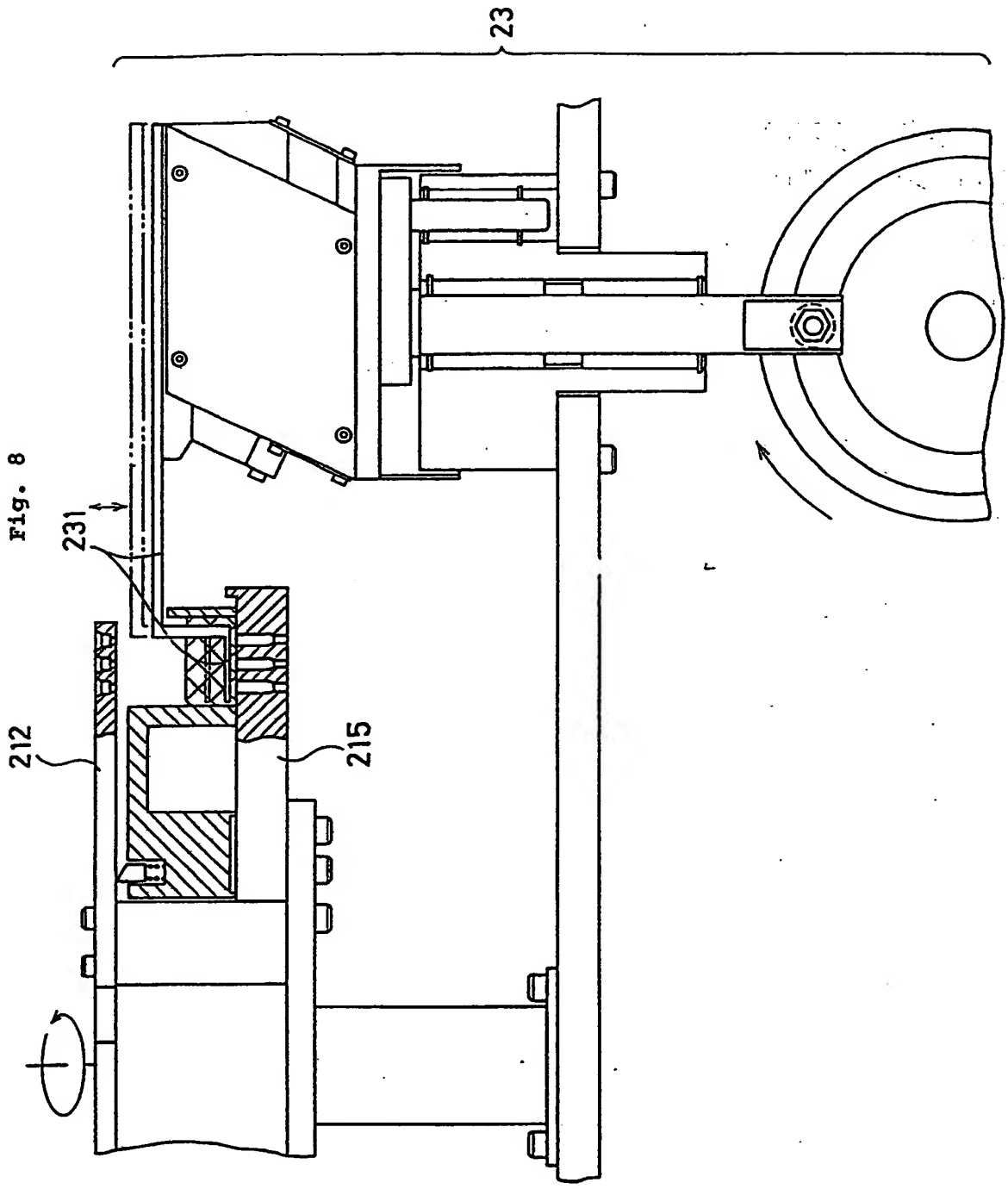


Fig. 8

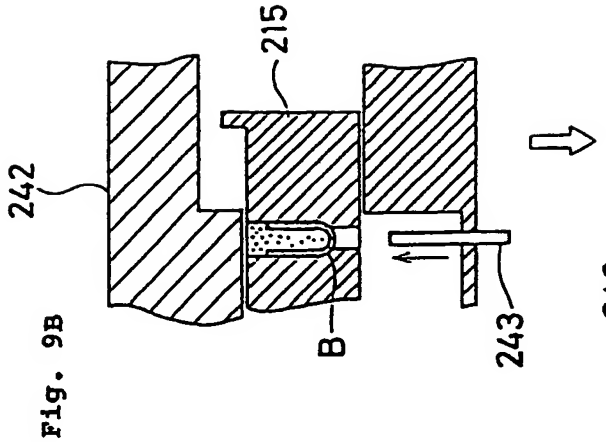


Fig. 9B

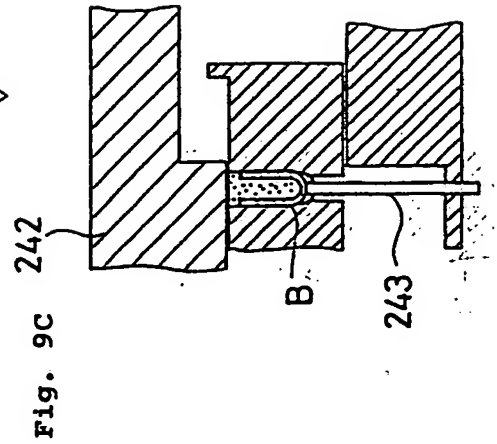


Fig. 9C

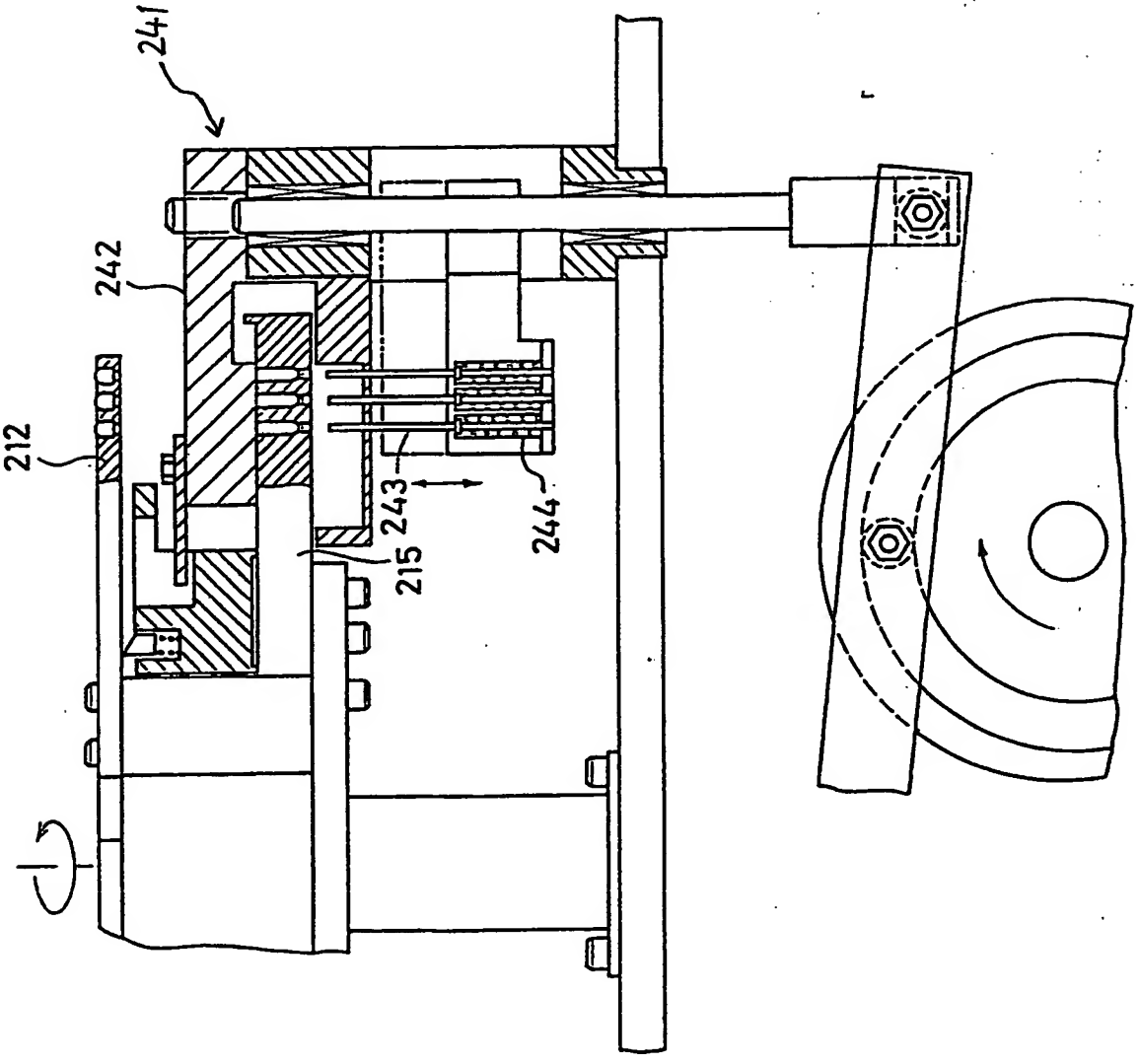
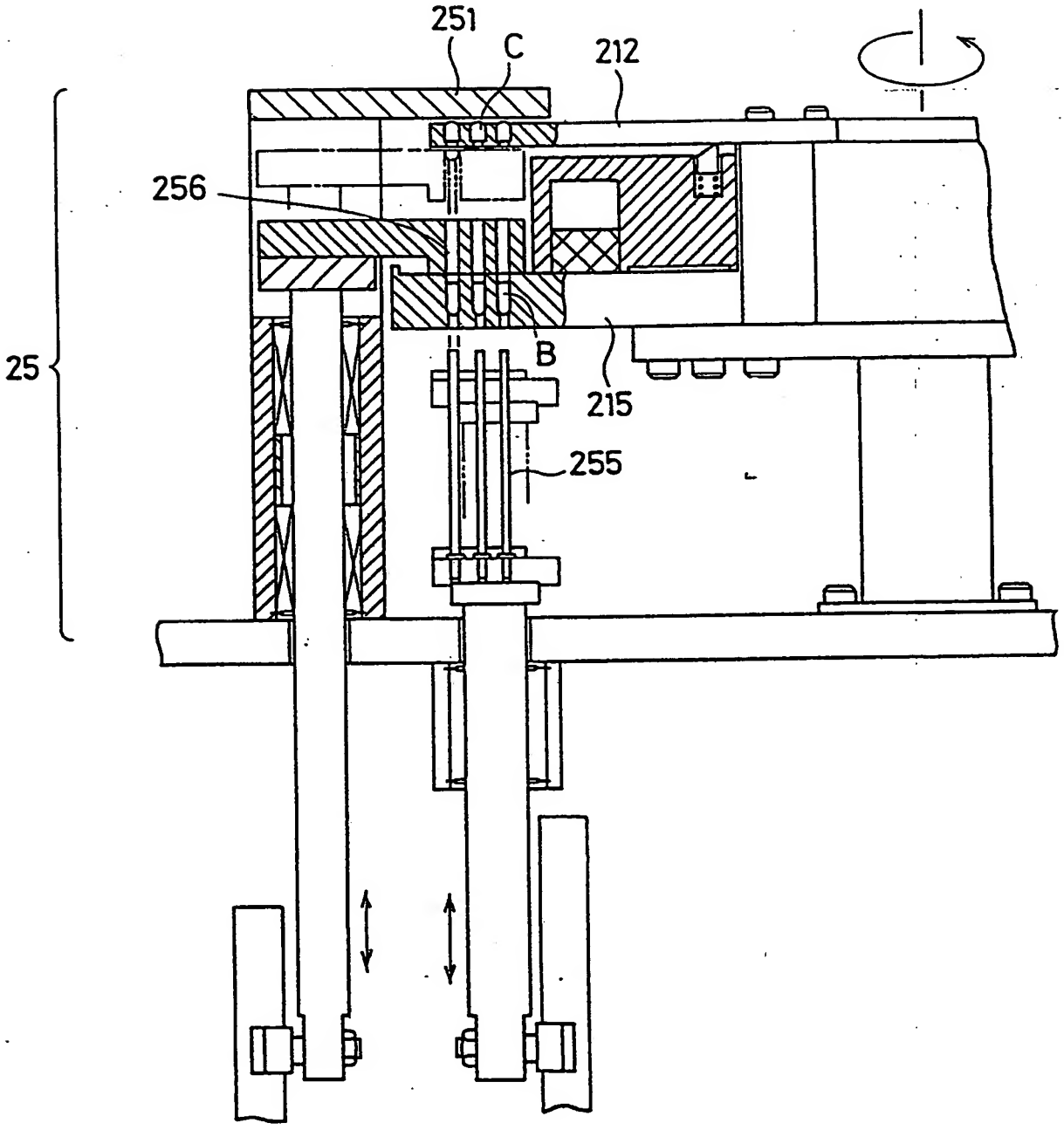


Fig. 9A

Fig. 10



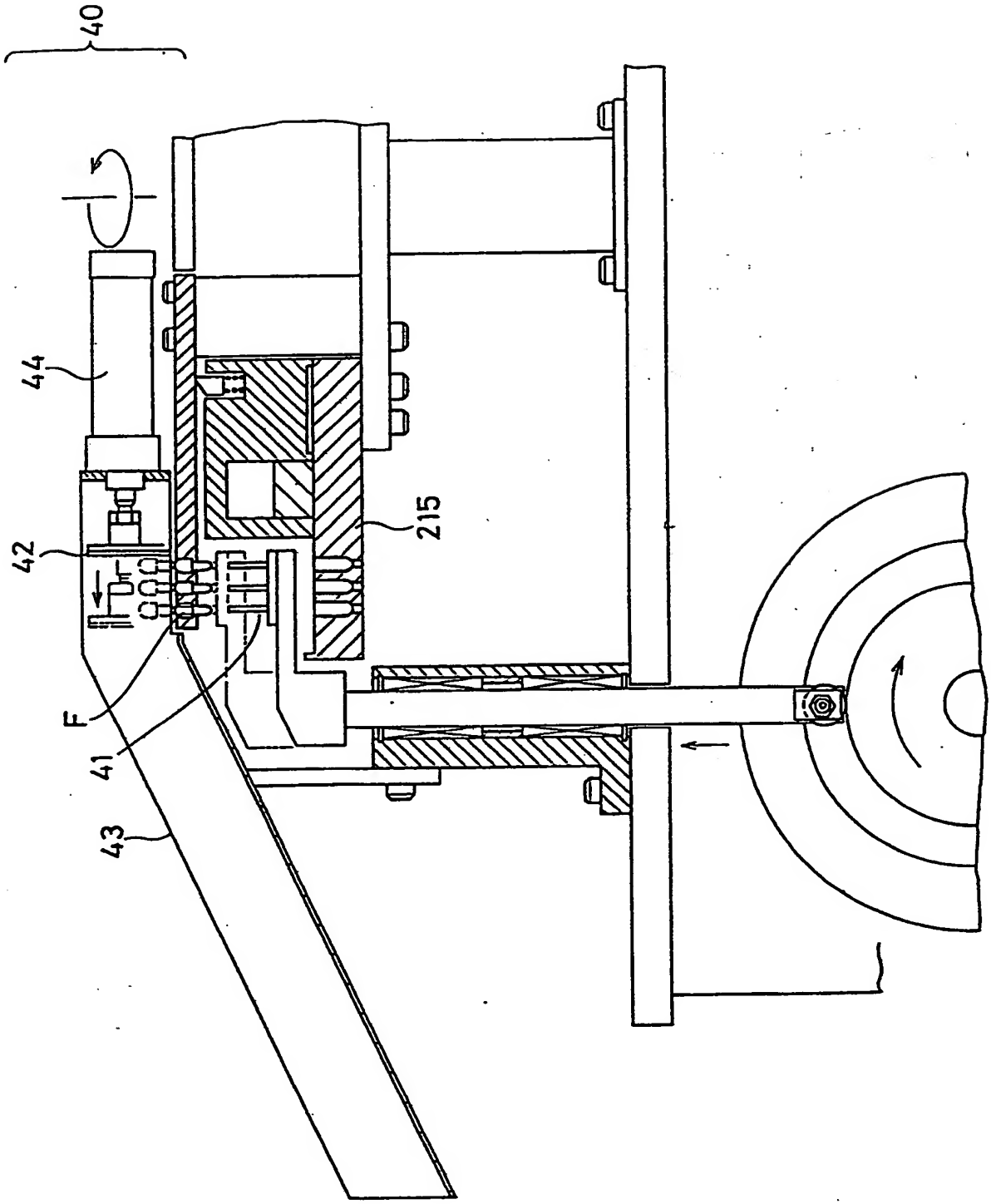


Fig. 11

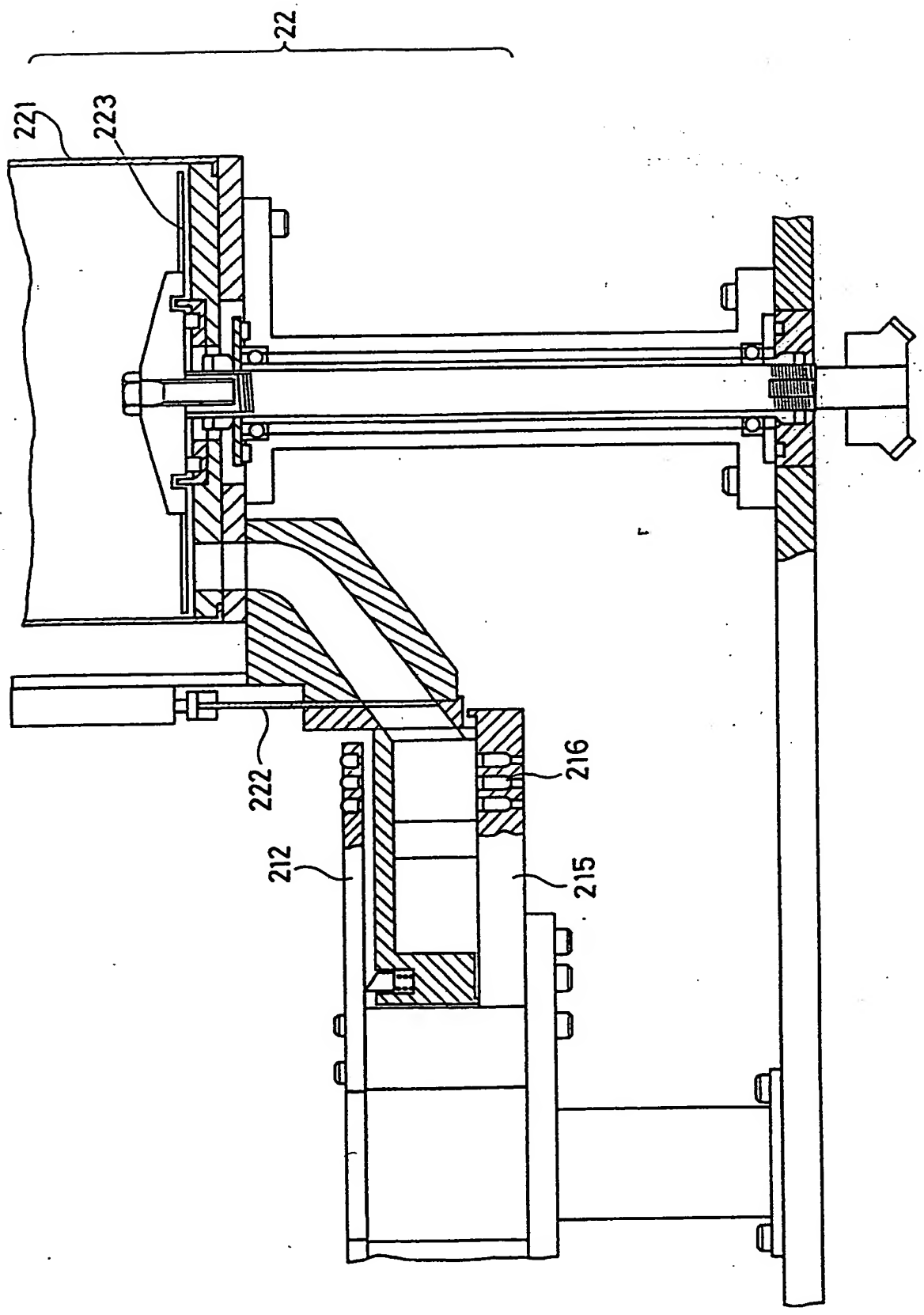


Fig. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 31 3633

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A-1 545 686 (SANYO CO., LTD) * Page 2, lines 49-60; figures 1-9 *	1	A 61 J 3/07
A		2,3	
A	US-A-4 163 354 (AUSTIN) * Figures 1-10 *	1-3	
A,D	EP-A-0 194 505 (NIPPON ELANCO K.K.) * Figures 1-16 *	3,4	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 61 J
B 65 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14-03-1990	GODOT T.G.L.

CATEGORY OF CITED DOCUMENTS

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